EXHIBIT A

Exhibit Designated

HIGHLY CONFIDENTIAL ATTORNEYS' EYES ONLY

Under Stipulated Protective Order

EXHIBIT B

Exhibit Designated

HIGHLY CONFIDENTIAL ATTORNEYS' EYES ONLY

Under Stipulated Protective Order

EXHIBIT C

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION | **ATTORNEY DOCKET NO. 10060220-1**

I, a below named inventor, I hereby declare that:

My residence/correspondence post office address and citizenship are as stated below next to my name:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

APPARATUS, SYSTEMS AND METHODS FOR PROCESSING SIGNALS BETWEEN A TESTER AND A PLURALITY OF DEVICES UNDER TEST AT HIGH TEMPERATURES AND WITH SINGLE TOUCHDOWN OF A PROBE ARRAY

the specification of which is attached hereto unless the following box is checked:

☒ was filed on April 24, 2006 as US Application Serial No. or PCT International Application Number 11/410699 and was amended on _____ (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR 1.56.

Foreign Application(s) and/or Claim of Foreign Priority

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor(s) certificate listed below and have also identified below any foreign application for patent or inventor(s) certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE FILED	PRIORITY CLAIMED UNDER 35 U.S.C. 119
N/A			YES: ☐ NO: ☐
			YES: ☐ NO: ☐

Provisional Application

I hereby claim the benefit under Title 35, United States Code Section 119(e) of any United States provisional application(s) listed below:

APPLICATION SERIAL NUMBER	FILING DATE
N/A	

U. S. Priority Claim

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NUMBER	FILING DATE	STATUS (patented/pending/abandoned)
N/A		

POWER OF ATTORNEY:

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: PRACTITIONERS ASSOCIATED WITH CUSTOMER NUMBER 022878.

Send Correspondence to :

Customer Number 022878

AGILENT TECHNOLOGIES, INC.
Legal Department, DL 429
Intellectual Property Administration
P.O. Box 7599
Loveland, Colorado 80537-0599

Direct Telephone Calls To:

Cynthia S. Mitchell (970) 679-3136

OR

Gregory W. Osterloth (303) 291-3204

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Inventor: Romi Mayder **Citizenship: U.S.A.**
Residence: San Jose, California
Correspondence Post Office Address: P.O. Box 7599, Loveland, Colorado 80537-0599

Inventor's Signature _____ Date May 09, 2006

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION (Continued) | **ATTORNEY DOCKET NO. 10060220-1**

Full Name of # 2 Joint Inventor: Pam Stellmacher **Citizenship: U.S.A.**
Residence: Cupertino, California
Correspondence Post Office Address: P.O. Box 7599, Loveland, Colorado 80537-0599

Pam Stellmacher
Inventor's Signature

May 9, 2006
Date

Full Name of # 3 Joint Inventor: Edmundo Dela Puente **Citizenship: U.S.A.**
Residence: Cupertino, California
Correspondence Post Office Address: P.O. Box 7599, Loveland, Colorado 80537-0599

Inventor's Signature

May 9, 2006
Date

Full Name of # 4 Joint Inventor: John Andberg **Citizenship: U.S.A.**
Residence: Santa Cruz, California
Correspondence Post Office Address: P.O. Box 7599, Loveland, Colorado 80537-0599

John Andberg
Inventor's Signature

May 9, 06
Date

Full Name of # Joint Inventor: **Citizenship:**
Residence:
Correspondence Post Office Address:

Inventor's Signature

Date

Full Name of # Joint Inventor: **Citizenship:**
Residence:
Correspondence Post Office Address:

Inventor's Signature

Date

Full Name of # Joint Inventor: **Citizenship:**
Residence:
Correspondence Post Office Address:

Inventor's Signature

Date

Full Name of # Joint Inventor: **Citizenship:**
Residence:
Correspondence Post Office Address:

Inventor's Signature

Date

Full Name of # Joint Inventor: **Citizenship:**
Residence:
Correspondence Post Office Address:

Inventor's Signature

Date

EXHIBIT D

US 20070247140A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0247140 A1**

Mayder et al. (43) **Pub. Date: Oct. 25, 2007**

(54) **APPARATUS, SYSTEMS AND METHODS FOR PROCESSING SIGNALS BETWEEN A TESTER AND A PLURALITY OF DEVICES UNDER TEST AT HIGH TEMPERATURES AND WITH SINGLE TOUCHDOWN OF A PROBE ARRAY**

(76) Inventors: **Romi Mayder**, San Jose, CA (US); **Pam Stellmacher**, Cupertino, CA (US); **Edmundo Dela Puente**, Cupertino, CA (US); **John Andberg**, Santa Cruz, CA (US)

Correspondence Address:
VERIGY
4700 INNOVATION WAY, BLDG D1
FORT COLLINS, CO 80528 (US)

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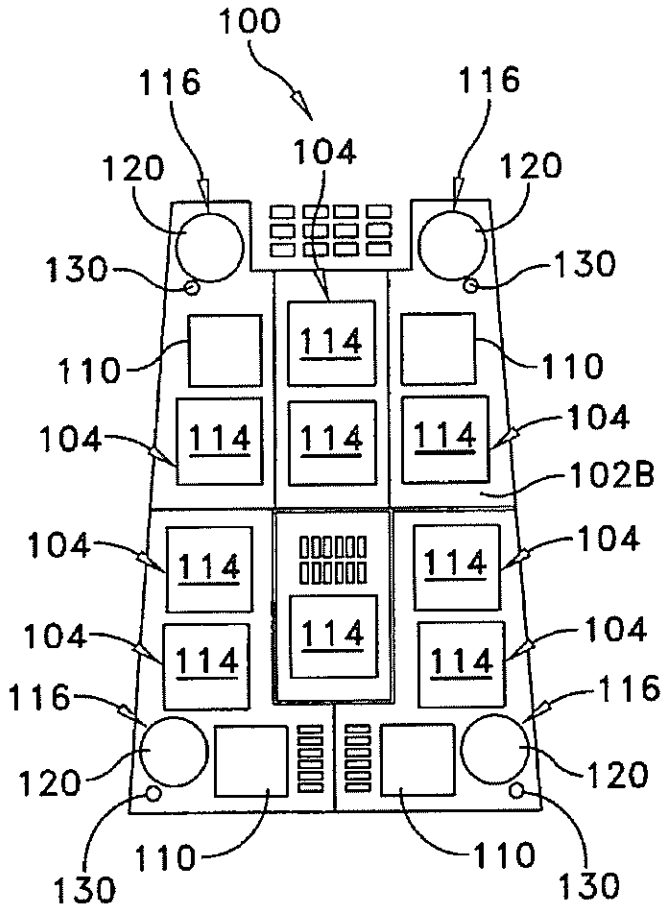
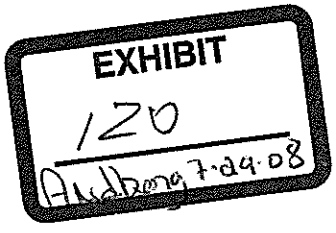
G01R 31/28 (2006.01)

(52) **U.S. Cl.** **324/158.1**

(57) **ABSTRACT**

Apparatus is for processing signals between a tester and devices under test. In one embodiment, the apparatus includes at least one multichip module. Each multichip module has a plurality of micro-electromechanical switches between a set of connectors to the tester and a set of connectors to devices under test. At least one driver is provided to operate each of the micro-electromechanical switches. A method of processing signals between a tester and devices under test is disclosed. In an embodiment, the method includes connecting the tester and the devices under test with at least one multichip module. Each of the at least one multichip module has a plurality of micro-electromechanical switches between a set of connectors to the tester and a set of connectors to the devices under test. The method includes operating each of the micro-electromechanical switches. Other embodiments are also disclosed.





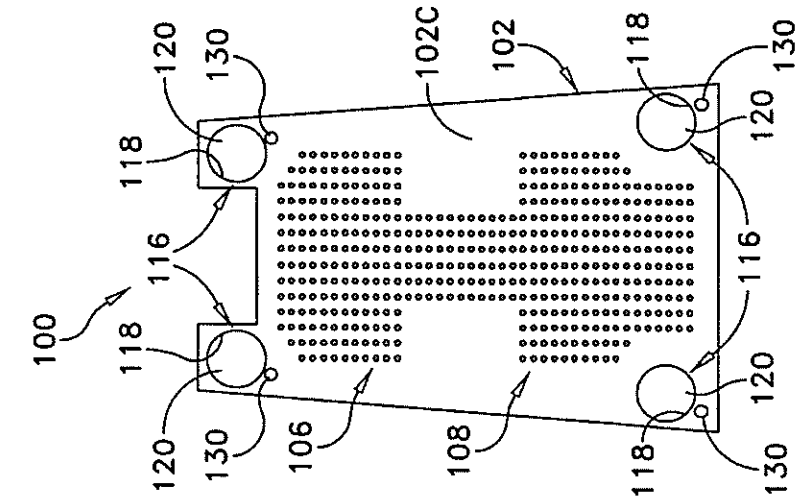


FIGURE 3

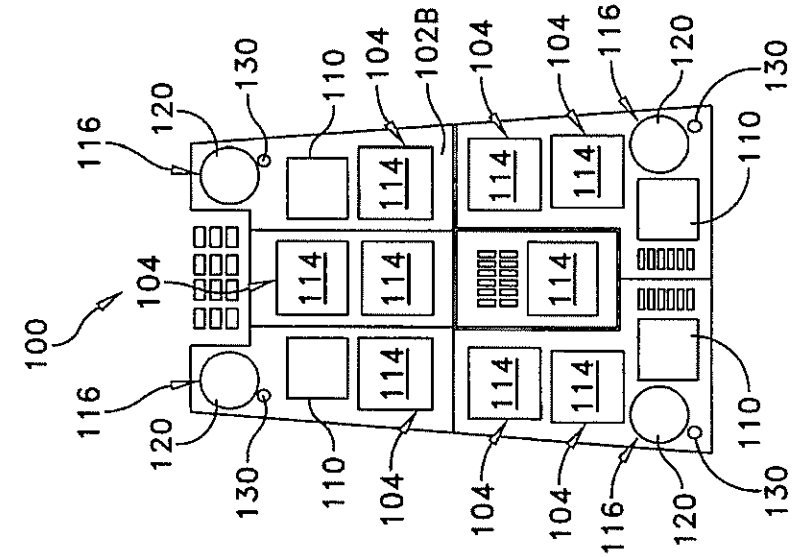


FIGURE 2

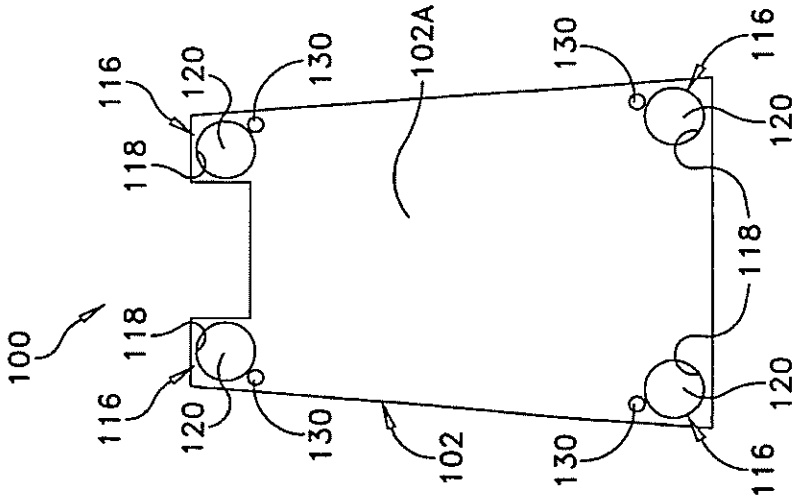


FIGURE 1

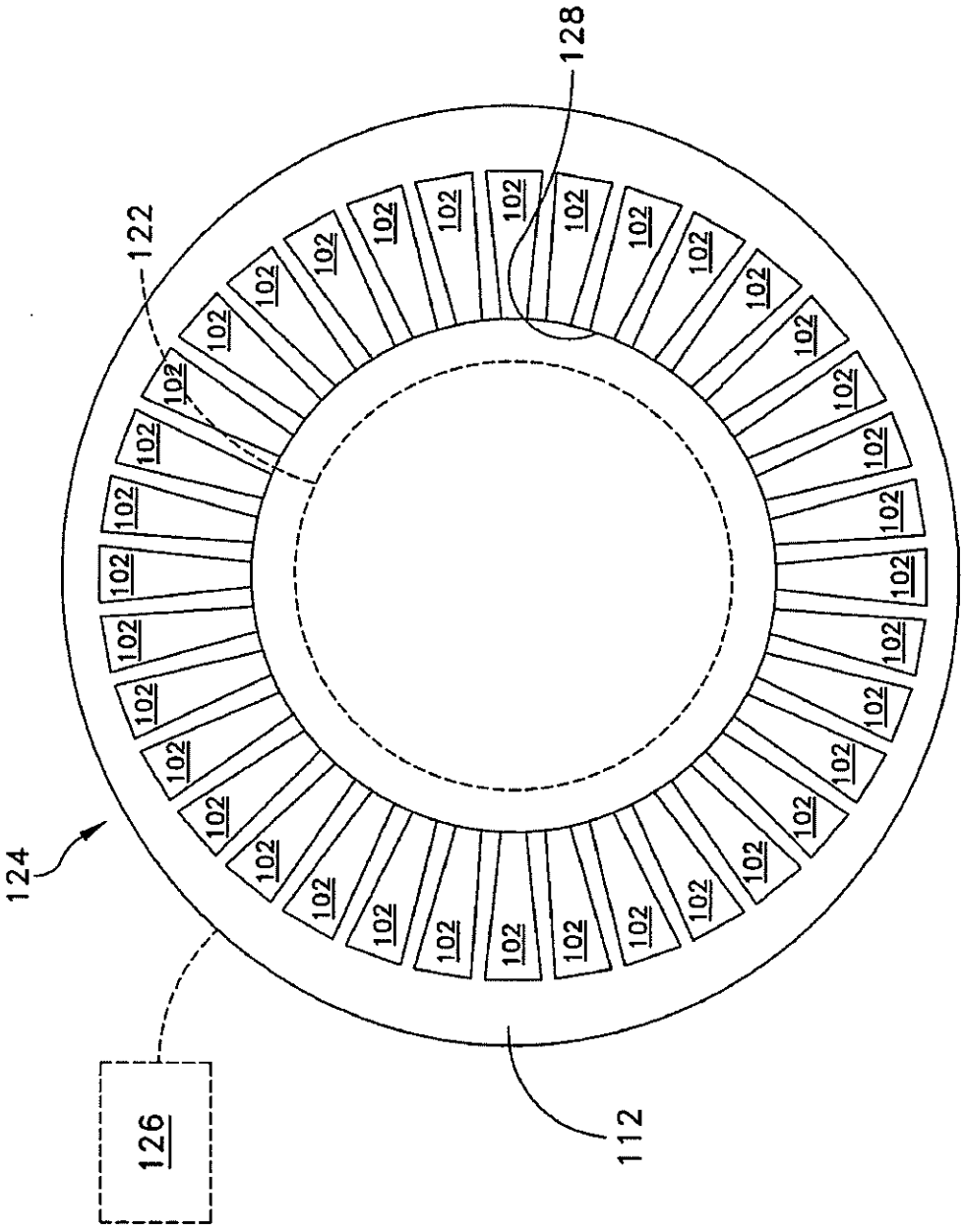


FIGURE 4

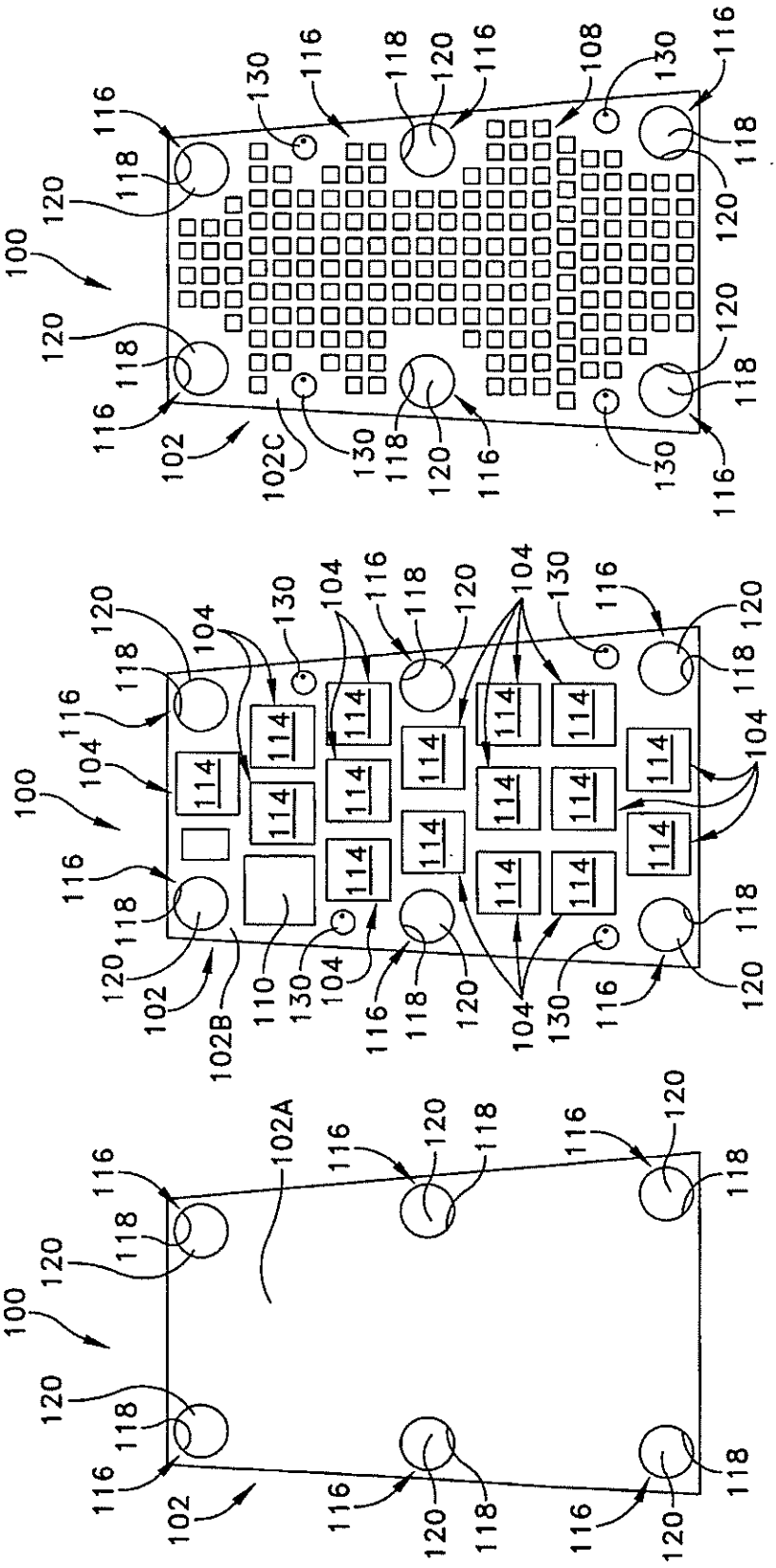


FIGURE 5

FIGURE 6

FIGURE 7

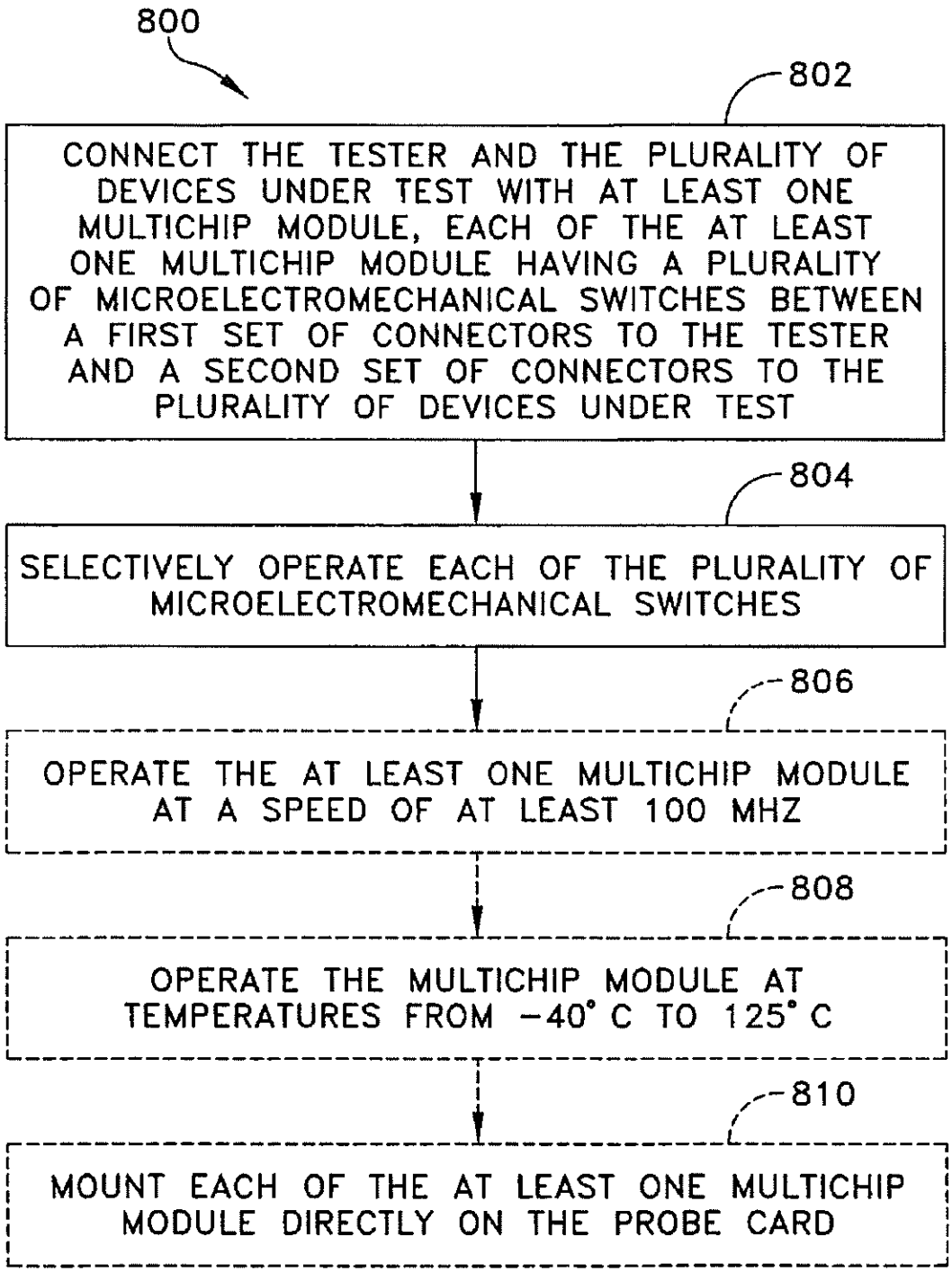

800
802
CONNECT THE TESTER AND THE PLURALITY OF DEVICES UNDER TEST WITH AT LEAST ONE MULTICHIP MODULE, EACH OF THE AT LEAST ONE MULTICHIP MODULE HAVING A PLURALITY OF MICROELECTROMECHANICAL SWITCHES BETWEEN A FIRST SET OF CONNECTORS TO THE TESTER AND A SECOND SET OF CONNECTORS TO THE PLURALITY OF DEVICES UNDER TEST
804
SELECTIVELY OPERATE EACH OF THE PLURALITY OF MICROELECTROMECHANICAL SWITCHES
806
OPERATE THE AT LEAST ONE MULTICHIP MODULE AT A SPEED OF AT LEAST 100 MHZ
808
OPERATE THE MULTICHIP MODULE AT TEMPERATURES FROM −40° C TO 125° C
810
MOUNT EACH OF THE AT LEAST ONE MULTICHIP MODULE DIRECTLY ON THE PROBE CARD

FIGURE 8

APPARATUS, SYSTEMS AND METHODS FOR PROCESSING SIGNALS BETWEEN A TESTER AND A PLURALITY OF DEVICES UNDER TEST AT HIGH TEMPERATURES AND WITH SINGLE TOUCHDOWN OF A PROBE ARRAY

BACKGROUND

[0001] Others have developed solutions for two touchdown testing of 300 mm wafers containing many NAND dice, e.g. 432 NAND dice having 16 test sites each for a total of 6912 test sites. Generally, this type of testing utilizes mechanical relays installed in the device under test (DUT) interface of the automatic test equipment (ATE) system. These relays are typically located electrically far away from the device under test (DUT). This distance may create a large impedance mismatch when reading back from the device. In addition, the maximum data rate for testing the device may be limited to only 20 MHz.

[0002] Mechanical relays are also quite expensive. For example, the typical mechanical relays may each cost about $8.00. This may limit the return on investment (ROI) for the customer. Mechanical relays are generally rated for about 1 to 10 million test cycles. This may create reliability issues for the customer over time. Furthermore, mechanical relays are only rated for operation up to 85° C. This allows testing of NAND devices using mechanical relays at or below 85° C.

[0003] Other solutions for multiplexing a large number of tester pin electronics (PE) by mounting a plurality of daughter boards on probe cards. This will only allow two touchdown testing of 300 mm wafers of NAND dice. This daughter card approach has limitations with respect to temperature and density. The connector limits the density of switches that can be placed on the daughter card and the active silicon switches have a temperature limitation of 85° C. when using standard grade integrated chips.

SUMMARY OF THE INVENTION

[0004] In an embodiment, there is provided apparatus for processing signals between a tester and a plurality of devices under test, the apparatus comprising at least one multichip module, each of the at least one multichip module comprising a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test; and at least one driver to selectively operate each of the plurality of micro-electromechanical switches.

[0005] In another embodiment, there is provided a system for testing a plurality of devices under test, the system comprising a set of tester electronics to generate signals for application to the plurality of devices under test, and to receive signals generated by the plurality of devices under test; a probe card with at least one multichip module mounted thereon, each of the at least one multichip module comprising a plurality of micro-electromechanical switches between a first set of connectors to the set of tester electronics and a second set of connectors to the plurality of devices under test, and a driver to selectively operate each of the plurality of micro-electromechanical switches; and a probe array to transmit signals between the at least one multichip module of the probe card and the plurality of devices under test.

[0006] In yet another embodiment, there is provided apparatus for processing signals between a tester and a plurality of devices under test, the apparatus comprising at least one multichip module mounted directly on a probe card and operable at a temperature of at least 125° C., and each of the at least one multichip module having a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test.

[0007] In still another embodiment, there is provided a method of processing signals between a tester and a plurality of devices under test, the method comprising connecting the tester and the plurality of devices under test with at least one multichip module, each of the at least one multichip module having a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test; and selectively operating each of the plurality of micro-electromechanical switches.

[0008] Other embodiments are also disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Illustrative embodiments of the invention are illustrated in the drawings, in which:

[0010] FIGS. **1-3** illustrate one exemplary embodiment of a multichip module for processing signals between a tester and a plurality of devices under test;

[0011] FIG. **4** illustrates a system having a probe card with a plurality of multichip modules for processing signals between a tester and a plurality of devices under test;

[0012] FIGS. **5-7** illustrate another exemplary embodiment of a multichip module for processing signals between a tester and a plurality of devices under test; and

[0013] FIG. **8** is a flow chart diagram illustrative of methods of processing signals between a tester and a plurality of devices under test.

DETAILED DESCRIPTION OF AN EMBODIMENT

[0014] Referring to FIGS. **1-7**, there is shown apparatus **100** for processing signals between a tester and a plurality of devices under test. In one embodiment, apparatus **100** may include various types of multichip modules **102**, which are also referred to as MCMs **102**. FIGS. **1-3** illustrate one exemplary embodiment of multichip module **102**. FIGS. **4-7** illustrate another exemplary embodiment of multichip module **102**.

[0015] A top cover **102A** of multichip module **102** is shown in FIGS. **1** and **5**. A cross-sectional plan view **102B** of multichip module **102** is shown in FIGS. **2** and **6**. A bottom portion **102C** is shown in FIGS. **3** and **6**.

[0016] Referring to FIGS. **2** and **5**, and each multichip module **102** may include a plurality of micro-electromechanical switches **104**, which are also refered to as MEMs **104**, between a first set of connectors **106** to the tester and a second set of connectors **108** to the plurality of devices under test. Each multichip module may include at least one driver **110** to selectively operate each of the plurality of micro-electromechanical switches **104**.

[0017] Looking at FIG. **4**, and in an embodiment, apparatus **100** for processing signals may include a configuration in which each of multichip modules **102** are mounted directly on a probe card **112**. Due to the proximity of multichip modules **102** to probe card **112** and the devices under test (not shown), one or more of multichip modules **102** may operate at a speed of at least 100 MHz. In another embodiment, one or more of multichip modules **102** may operate at a speed above 20 MHz to about 100 MHz.

[0018] In an embodiment, one or more of multichip modules **102** may operate at a temperature with a range from about −40° C. to about 125° C. In another embodiment, one or more of multichip modules **102** may operate within a temperature range from about 85° C. to about 125° C.

[0019] In one embodiment, one or more of multichip modules **102** may be rated for at least 1 billion test cycles. Multichip modules **102** may be rated for 10 billion or more test cycles. This is due, at least in part, to the micro-electromechanical switches **104** that may be used instead of other types of switches.

[0020] Referring to FIGS. **2** and **6**, and in an embodiment, the plurality of micro-elecromechanical switches **104** may be housed in separate MEMs dice **114**. In one embodiment, each of the separate MEMs dice **114** may include eight single pole triple throw switches (FIG. **2**). In another embodiment, each of the separate MEMs dice **114** may include eight single pole double throw switches (FIG. **6**).

[0021] Looking at FIGS. **1-3** and **5-7**, an attachment component **116** may be provided to secure one or more of multichip modules **102**. In an embodiment, attachment component **116** mounts multichip module **102** to probe card **112** (FIG. **4**). Attachment component **116** may include passageways **118** through multichip module **102** for a set of screws **120** to mount the multchip module to probe card **112** (FIG. **4**).

[0022] As MEM MCM **102** may be attached to probe card **112** using screws **120** or other fasteners, a new tester does not need to be purchased from a supplier of the ATE system. A customer may simply design a probe care and attach these MEM MCMs to the probe card and install this new probe card assembly onto an existing ATE system.

[0023] Generally, MCM **102** may be very thin to allow probe card **112** together with MCMs **102** to fit into an auto loader of a prober. Many screws **120** or other fasteners may be used to attach MCM **102** to probe card **112** to prevent warping.

[0024] In an embodiment, one or more of drivers **110** may designed to supply an electrostatic potential to selectively activate a MEMs gate associated with one or more of the plurality of micro-electromechanical switches **104**. One or more of drivers **110** may be a vacuum-florescent display driver die **110**. In one embodiment, four drivers **110** (FIG. **2**) act as an algorithmic pattern generating system (APGS) and supply the electrostatic potential to four separate DUTs independently of one another. In another embodiment, one driver **110** (FIG. **6**) acts as an algorithmic pattern generating system (APGS) and supplies electrostatic potential to DUTs.

[0025] In one embodiment, the second set of connectors of multichip modules **102** attach to a probe array **122**. This probe array **122** may have at least 6000 probe tip needles so as to test at least 6000 test sites of the plurality of devices under test during a single touchdown of probe array **122**. For example, each multichip module **102** may test 12 DUTs, there may be 36 multichip modules in attachment to probe card **112** for a total of 432 DUTs, and there may be 16 test sites on each one of the DUTs for a total of 6912 test sites, which in turn requires 6912 probe tip needles.

[0026] Referring to FIG. **4**, and in an embodiment, there is shown a system **124** for testing a plurality of devices under test. System **124** may include a set of tester electronics **126** to generate signals for application to the plurality of devices under test, and to receive signals generated by the plurality of devices under test. System **124** may include probe card **112** with at least one multichip module **102** mounted directly on probe card **112**. Each of the at least one multichip module **102** may include a plurality of micro-electromechanical switches **104** between a first set of connectors to the set of tester electronics **126** and a second set of connectors to the plurality of devices under test. System may include one or more drivers **110** to selectively operate each of the plurality of micro-electromechanical switches **104**. System **124** may further include probe array **122** to transmit signals between the multichip modules **102** of probe card **112** and the plurality of devices under test.

[0027] In one embodiment, probe card **112** may have **36** multichip modules **102** mounted thereon. Each of multichip modules **102** may have a plurality of MEMS dice **114** thereon. Furthermore, each one of the plurality of MEMS dice **114** may each contain a plurality of switches **104**. In one embodiment, switches **104** may include single pole triple throw switches. In another embodiment, switches **104** may include single pole double throw switches.

[0028] Looking at FIG. **1**, and in an embodiment, each of multichip modules **102** may have 9 MEMS dice **114** thereon. In one embodiment, each of the 9 MEMS dice **114** may have 8 MEMS switches **104**. Looking at FIG. **4**, and in another embodiment, each of multichip modules **102** may have 16 MEMS dice **114** thereon. In an embodiment, each of the 16 MEMS dice **114** may have 8 MEMS switches **104**.

[0029] Referring to FIGS. **3** and **7**, and in an embodiment, each one multichip module **104** may be housed in a standard package configuration having 780 pins which may be configured on bottom portion **102C**. A portion of the 780 pins form first set of connectors **106**, which may provide electrical connection to tester electronics. Another portion of the 780 pins form second set of connectors **108**, which may provide electrical connection to devices under test.

[0030] Probe card **112** may have a maximum diameter of 440 millimeters. Probe card **112** may form an opening **128** for probe array **122**. In an embodiment, opening **128** has a minimum diameter of 330 millimeters. Probe card **112** may contains at least 36 of multichip modules **102** mounted thereon.

[0031] In an embodiment, probe array **112** may have at least 6000 probe tip needles so as to test at least 6000 test sites of the plurality of devices under test during a single touchdown of probe array **112**.

[0032] In an embodiment, system **124** enables one touchdown testing of 300 mm wafers containing NAND devices to be tested up to 100 MHz by mounting micro-electromechanical multichip modules **102** very close to the DUTs.

This one touchdown testing cannot be achieved by using mechanical relays or active silicon devices mounted on daughter boards. Daughter boards mounted on the probe cannot achieve the required density of switches because of the space required for connectors. Mechanical relays, which are mounted far from the DUTs, are generally limited to about 20 MHz and cannot achieve a data rate near 100 MHz.

[0033] For example, and looking at FIGS. **1-3**, to achieve a desired data rate of about 20 MHz to about 100 MHz, 72 single-pole, triple-throw (SPTT) MEM switches **104** and four vacuum-florescent display driver dice (VFD) **110** may be integrated into one 780 pin multichip module (MCM) **102**. This MCM **102** may measure 26 mm×55 mm×34 mm×55 mm (see FIG. **1**).

[0034] In one embodiment, and looking at FIGS. **5-7**, to achieve a desired data rate of about 20 MHz to about 100 MHz, 128 single-pole, double-throw (SPDT) MEM switches **104** and one vacuum-florescent display driver die (VFD) **110** with 32 outputs may be integrated into one 780 pin multichip module (MCM) **102**. This MCM **102** may measure 26 mm×55 mm×34 mm×55 mm (see FIG. **5**).

[0035] MEM MCMs **102** may be fabricated quite inexpensively. For example, an MCM package containing 128 SPDT switches with only 780 pins may cost about $300 per package. This drastically improves the return on investment (ROI) for the customer.

[0036] As discussed above, mechanical relays are generally rated a maximum testing temperature of 85° C., which is due to the moving parts inside the relay housing. Implementations using active silicon devices are also typically rated for a maximum testing temperature of 85° C. Using either of these, i.e. mechanical relays or daughter boards with active silicon, NAND devices may only be tested up to 85° C. However, using system **100**, NAND devices may be tested at temperatures ranging from −40° C. to 125° C. with one or more of MEM MCMs **102**.

[0037] MEM MCMs **102** are generally mounted very close to the DUTs so as to increase the maximum data rate for testing NAND devices from 20 MHz to 100 MHz, and also to enable testing of the entire 300 mm wafer with one touchdown.

[0038] Utilizing MEM MCMs **102** instead of mechanical relays is also more cost effective and more reliable. A typical mechanical relay is rated for 1-10 million cycles. A typical MEM MCM **102** may be rated for 1-10 billion cycles. Using daughter boards limits the density of switches that can be mounted on the probe card due to the space required for connectors.

[0039] Multichip modules **102** are generally capable of much higher densities than daughter cards. Mounting multichip modules **102** onto probe card **112** enables the customer to double the pin count of the test system when testing NAND devices without buying a new ATE system.

[0040] Using the Agilent V5400 test system, 16 NAND devices with 36 test sites each may be tested. Each MEMs dice may have 8 SPDT switches. The electrostatic potential required to activate the MEMs gate will be supplied by a vacuum-florescent display driver die **110** located inside the MCM package **102**. MCM substrate **102B** may be a blind and buried via substrate made of NELCO 4000-13 Si, which is a typical MCM substrate. Connectors **106** and connectors **108** may include, but are not limited to pins. Such pins of the package may include Be—Cu springs that are attached with silver epoxy to the bottom of the NELCO 4000-13 Si substrate. MEMs **104** and single VFD **110** may be located inside MCM **102** and may be wired bond or soldered to the substrate.

[0041] In an embodiment, MCMs **102** may be reusable. MCMs **102** can be transferred form one probe card to another when the probe card becomes damaged or is simply obsolete due to a change in die size or layout on the wafers.

[0042] Alignment pins **130** may be provided to align MCM **102** to probe card **112**.

[0043] Looking now at FIG. **8**, and in an embodiment, there is provided a method **800** of processing signals between a tester and a plurality of devices under test. Method **800** may include connecting **802** the tester and the plurality of devices under test with at least one multichip module, each of the at least one multichip module having a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test. Method **800** may include selectively operating **804** each of the plurality of micro-electromechanical switches.

[0044] In one embodiment, method **800** may further include operating **806** the at least one multichip module at a speed of at least 100 MHz. In an embodiment, method **800** may include operating **808** the multichip module at temperatures from −40° C. to 125° C.

[0045] Method **800** may include mounting **810** each of the at least one multichip module directly on the probe card.

1. Apparatus for processing signals between a tester and a plurality of devices under test, the apparatus comprising:

at least one multichip module, each of the at least one multichip module comprising:

a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test; and

at least one driver to selectively operate each of the plurality of micro-electromechanical switches.

2. Apparatus in accordance with claim **1**, further comprising a probe card on which each one of the at least one multichip module is directly mounted.

3. Apparatus in accordance with claim **1**, further comprising a plurality of MEMs dice on which the plurality of micro-elecromechanical switches are formed.

4. Apparatus in accordance with claim **1**, wherein the separate MEMs dice each include eight single pole triple throw switches.

5. Apparatus in accordance with claim **1**, further comprising an attachment component for each one of the at least one multichip module, and wherein the attachment component mounts the multichip module to a probe card.

6. Apparatus in accordance with claim **5**, wherein the attachment component includes passageways through the multichip module for a set of screws to mount the multchip module to the probe card.

7. Apparatus in accordance with claim **1**, wherein the driver is designed to supply an electrostatic potential to

activate a MEMs gate associated with each of the plurality of micro-electromechanical switches.

8. Apparatus in accordance with claim 1, wherein the at least one driver comprises a vacuum-florescent display driver dice.

9. A system for processing signals between a tester and a plurality of devices under test, the system comprising:

at least one multichip module mounted directly on a probe card and operable at a temperature of at least 125° C., and each of the at least one multichip module having a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test.

10. A system in accordance with claim 9, wherein the second set of connectors attach to a probe array having at least 6000 probe tip needles so as to test at least 6000 test sites of the plurality of devices under test during a single touchdown of the probe array.

11. A system for testing a plurality of devices under test, the system comprising:

a set of tester electronics to generate signals for application to the plurality of devices under test, and to receive signals generated by the plurality of devices under test;

a probe card with at least one multichip module mounted thereon, each of the at least one multichip module comprising a plurality of micro-electromechanical switches between a first set of connectors to the set of tester electronics and a second set of connectors to the plurality of devices under test, and a driver to selectively operate each of the plurality of micro-electromechanical switches; and

a probe array to transmit signals between the at least one multichip module of the probe card and the plurality of devices under test.

12. A system in accordance with claim 11, wherein each of the at least one multichip modules has a plurality of MEMS dice thereon.

13. A system in accordance with claim 11, wherein each one of the plurality of MEMS dice each contain a plurality of micro-electromechanical switches.

14. A system in accordance with claim 13, wherein the switches are single pole triple throw switches.

15. A system in accordance with claim 13, wherein the switches are single pole double throw switches.

16. A system in accordance with claim 11, wherein the probe card has a maximum diameter of 440 millimeters.

17. A system in accordance with claim 16, wherein the probe card forms an opening for the probe array, and the opening has a minimum diameter of 330 millimeters.

18. A system in accordance with claim 11, wherein the probe array has at least 6000 probe tip needles so as to test at least 6000 test sites of the plurality of devices under test during a single touchdown of the probe array.

19. A method of processing signals between a tester and a plurality of devices under test, the method comprising:

connecting the tester and the plurality of devices under test with at least one multichip module, each of the at least one multichip module having a plurality of micro-electromechanical switches between a first set of connectors to the tester and a second set of connectors to the plurality of devices under test; and

selectively operating each of the plurality of micro-electromechanical switches to process the signals between individual ones of the first set of connectors to the tester and selected multiple ones of the second set of connectors to the Plurality of devices under test.

20. A method in accordance with claim 19, further comprising operating the at least one multichip module at a speed of at least 100 MHz.

21. A method in accordance with claim 19, further comprising operating the multichip module at a temperature of at least 125° C.

22. A method in accordance with claim 19, further comprising mounting each of the at least one multichip module directly on the probe card.

23. A method in accordance with claim 19, further comprising mounting each of the at least one multichip module directly on the probe card, operating the multichip module at a temperature of at least 125° C., and operating the at least one multichip module at a speed of at least 100 MHz.

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